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### Feature Article - The International Comparison Program and Purchasing Power Parities

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#### INTRODUCTION

Economists and policy makers are increasingly interested in analysing living standards across countries and changes in their relative rankings over time. The different social and institutional arrangements that exist in countries around the world create difficulties for such international comparisons. Comparisons of economic data are further complicated because economic variables are expressed in different currencies. One method of converting economic data from a national currency to a common currency such as the \$US is to use exchange rates. It is appropriate to use exchange rates only in a few specific, limited circumstances, such as in calculating the value of imports able to be purchased from a given level of export receipts or in working out how many \$A are required to purchase a particular sum in a foreign currency. However, for international comparisons of levels of output and consumption and for other similar comparisons, using exchange rates as the means of converting values into a common currency can lead to quite misleading conclusions. For comparisons of this nature a more robust and appropriate method is to use "purchasing power parities" (or PPPs), which directly reflect differences in the prices of goods and services in different countries.

The International Comparison Program (ICP) is a world-wide statistical initiative to collect the data required to calculate PPPs. The ICP was first established in the 1960s. Its main aim is to enable comparisons to be made of the real levels of gross domestic product (GDP) and its major components, such as household final consumption expenditure, in countries around the world using PPPs rather than exchange rates to convert to a common currency.

The 2005 ICP round is being coordinated by the World Bank and it is by far the most comprehensive round in the 40 years or so since the inception of the ICP. Around 160 countries are participating in the 2005 ICP, which is being run on a regional basis with coordinators located in five regional organisations (the Asian Development Bank in the case of the Asia/Pacific region).

This article:

- explains what PPPs are designed to do and how they are calculated,
- provides some real-life examples which demonstrate why PPPs are preferred to exchange rates for most international

comparisons, and

- describes the efforts that are going into making the 2005 ICP the most comprehensive and firmly-based ICP round to date.

## INTERNATIONAL COMPARISONS

Much economic analysis concentrates on what is happening within an individual country. Economic statistics produced by each national statistical agency are expressed in the domestic currency, so comparisons can be made easily between different sets of domestic data. However, from time to time, economists are interested in comparing economic data from different countries. In some cases, it is fairly easy to do so (e.g. such as comparing the recent growth rate of GDP in Australia with that in the USA). In this case, the monetary units in which the underlying data are expressed are not important because it is the rate of growth rather than the level of activity that is being compared. Other types of comparisons are less straightforward. For example, there is often interest in the relative levels of activity between countries or in obtaining an overall total measure of activity for a group of countries such as those in the OECD. It is common to see figures quoted for the level of GDP per capita in countries as a measure of relative economic well-being, or an overall growth rate for, say, the whole of the 30 OECD countries. In the former case, the main problem in making the comparison is in adjusting the data expressed in national currency units to a common currency such as the \$US. In the latter case, it is necessary to aggregate across different currencies (\$A, euro, British pound etc).

One method of converting economic data from a national currency to a common currency such as the \$US is to simply use exchange rates. An exchange rate represents the “price” of a foreign currency (i.e. the number of units of the domestic currency required to purchase one unit of a foreign currency). As such, it is clear that it is appropriate to use exchange rates for applications such as calculating the volume of goods and services that could be imported with the proceeds of a particular level of exports or calculating the domestic currency costs of purchasing foreign goods and services abroad. However, in assessing relative standards of living, it is necessary to have a means of comparing the volumes of goods and services actually available to residents of different countries in their own countries. Using exchange rates to convert the national currency values can be misleading because exchange rates are influenced by factors other than relative domestic price levels (e.g. financial flows and interest rate differentials can have a significant effect on exchange rates) and are often quite volatile, particularly in the short term. At times, the size of changes in the \$A exchange rate could alter Australia’s world ranking based on per capita volumes of GDP even though nothing fundamental has changed in the underlying economic circumstances of either Australia or the countries with which it is being compared. PPPs are specifically designed to provide the rates of currency conversion that equalise the internal purchasing power of different currencies. Converting national currencies using PPPs eliminates the effects of different price levels between countries.

The simplest example of a PPP is regularly presented by The Economist magazine, which shows the relative levels of the prices of Big Mac hamburgers between various countries. This form of presentation provides an indication of which countries are “expensive” (i.e. those whose PPP for a Big Mac is higher than the equivalent price based on exchange rates) and those that are cheap”. For example, if a big Mac costs \$3.50 in Australia and €3.10 in France then, given the current exchange rate of \$A1.00 = €0.62, it would be necessary to exchange \$5.00 in Australian currency to obtain sufficient euros to buy a Big Mac in France. In other words, based on the “Big Mac Index” France is an expensive country compared with Australia. Of course, Big Macs are only a very small part of expenditures in both countries. The reason The Economist uses Big Macs as the basis of its comparisons is that they are comparable across countries. In practice, more sophisticated PPPs are constructed by calculating the relative prices of a much broader range of goods and services covering all the major components of the national accounts estimates of expenditures on GDP.

To calculate PPPs, it is necessary to identify goods and services that are identical in all the countries involved in the comparison and for which prices can be collected. The goods and services concerned need to be representative of the expenditures in each country as well as being comparable between the countries. Tensions arise in identifying products that meet these two criteria, so compromises have to be made in the process.

## **NATIONAL ACCOUNTS AND PPPS**

The framework underlying the national accounts, which influences standards for most economic statistics (including PPPs) is the System of National Accounts, 1993 (commonly referred to as "SNA93"). It was produced jointly by the United Nations Statistics Division, the OECD, the IMF, the World Bank and Eurostat (the European Union statistical office). The adoption of the SNA by the majority of national statistical agencies means an internationally comparable set of national accounts data with accepted and well-understood aggregates is available.

SNA93 strongly recommends using PPPs in international comparisons of real production and consumption. Paragraph 1.38 states:

"..... When the objective is to compare the volumes of goods or services produced or consumed per head, data in national currencies must be converted into a common currency by means of purchasing power parities and not exchange rates. It is well known that, in general, neither market nor fixed exchange rates reflect the relative internal purchasing powers of different currencies. When exchange rates are used to convert GDP, or other statistics, into a common currency the prices at which goods and services in high-income countries are valued tend to be higher than in low-income countries, thus exaggerating the differences in real incomes between them. Exchange rate converted data must not, therefore, be interpreted as measures of the relative volumes of goods and services concerned. ....".

Paragraphs 16.82 to 16.104 of SNA93 provide a detailed description of PPPs and the methods of calculating them.

## **CALCULATING PPPS**

Calculating high quality PPP statistics requires high quality national accounts and price data for each of the countries for which PPPs are being calculated. Price data are weighted using national accounts data to form PPPs which are then divided into national accounts aggregates to convert them to a common currency.

As mentioned previously, most countries prepare national accounts statistics. However the quality varies across countries, with less developed countries tending to have poorer quality national accounts than the more developed countries. Most countries collect price information of some sort, typically for the purpose of compiling a consumer price index. Again the quality varies from country to country. However, because the national accounts aggregates for which PPPs are to be constructed are generally broad in coverage, a comprehensive suite of PPPs requires a broader range of prices than those collected for the CPI. Furthermore, in order to make international comparisons, the prices collected must be consistent with the methods of valuation used to compile the national accounts (usually expressed as being "representative") as well as being comparable between countries. For these reasons, collecting prices for PPP statistics typically involves additional effort for the countries involved.

PPPs for an individual product group (e.g. rice) are derived using the price ratios of all the products within the product group which can be matched between each pair of countries. The

product groups are referred to as “basic headings”. They are derived from national accounts data, which are split into about 220 categories in the OECD/Eurostat PPP Program. These have been collapsed into 155 basic headings for the ICP. The aim is to provide consistent expenditures that can be used to weight together the PPPs that have been derived at these detailed levels to obtain PPPs for GDP and its major aggregates (e.g. household final consumption expenditure).

Calculating PPPs is dependent on being able to collect the prices for similar products across all the countries in the comparison. The problem of matching up economies that are significantly different (e.g. Germany and Thailand) is handled by calculating PPPs for groups of like countries (handled by the “regionalisation” approach in the 2005 ICP) and then using countries that can price products common to more than one region as a “bridge” to link the regions together.

If the quality of a country’s national accounts and/or prices information is poor, then the quality of the PPP statistics for that country will also be poor. However, poor quality national accounts also directly affect an exchange-rate based comparison.

## **PPPS VERSUS EXCHANGE RATES IN MAKING INTERNATIONAL COMPARISONS**

The United Nations Statistical Commission (UNSC) became concerned several years ago about the misleading international comparisons which were based on using exchange rates to adjust values expressed in national currencies into a common currency. The issue arose in the context of the United Nations Development Programme’s (UNDP) annual “Human Development Report” (HDR). Some significant problems arose in interpreting the HDR because parts of the international comparisons were based on exchange rates rather than PPPs. In 2000, the chair of the UNSC appointed a small group to review the relative merits of PPPs versus exchange rates in international comparisons of the type included in the HDR.

The report of this review (footnote 1) was presented to the March 2001 UNSC meeting.

The report revealed a consensus that the statistical problems involved in using PPPs when making international comparisons are of a much smaller magnitude than those associated with using exchange rates in such analyses.

In particular, the review team reported that:

“.....[there are] two important shortcomings of PPP conversion use that require a response. The first is the question of quality of the measurement instruments of the basic data, the data collection and the calculation of PPPs. The second is the question of coverage for the countries of the world. We acknowledge ..... that these are both important issues but they are not in our view of sufficient weight to justify the use of US dollar exchange rate conversion rather than PPP conversion. .... the quality issue [of PPP data] cannot justify switching from the PPP estimate to a US dollar exchange rate, which can be more than three times smaller for least developed countries. Given such large differences between the two measures, using the wrong measure because it is more accurate does not satisfy a “fitness-for-purpose” criterion.”

The report also presented an analysis of comparisons using physical measures of output and the use of goods and services. It showed that, despite the data problems so often referred to when PPPs are mentioned, the PPP data at the level of GDP provide a much more plausible comparison between various pairs of countries than does a comparison based on exchange rates. The report reaffirmed SNA93 by recommending that PPPs rather than exchange rates should be used in international comparisons of real production and living standards because exchange rates produce distorted results. As a consequence, UNDP changed the HDR so that the international comparisons were based on PPPs rather than exchange rates.

In practice, exchange rate comparisons systematically understate per capita GDP in less

economically developed countries compared with those with relatively high GDP per capita. The reason is based on the productivity differentials between high and low-income countries and is described as follows by the architects of the International Comparison Project (footnote 2):

“International trade tends to drive the prices of traded goods, mainly commodities, towards equality in different countries [based on exchange rates]. With equal or nearly equal prices, wages in the traded goods industries in each country will depend upon productivity. Wages established in the traded goods industries within each country will prevail in the country’s nontraded goods industries. In nontraded goods industries, however, international productivity differentials tend to be smaller. Consequently, in a high-productivity country high wages lead to high prices of services and other nontraded goods, whereas in a low-productivity country low wages produce low prices. The lower a country’s income, the lower will be the prices of its home goods and the greater will be the tendency for exchange-rate conversions to underestimate its real income relative to that of richer countries.”

## OUTCOMES BASED ON PPPS VERSUS OUTCOMES BASED ON EXCHANGE RATES

Empirical results also show that exchange rates do not provide a suitable starting point for assessing changes over time because they are such a fundamentally flawed means of comparison. In its publication *Purchasing Power Parities and Real Expenditures – 2002 Benchmark Year* (OECD, Paris, 2004), the OECD showed that PPP-converted GDPs make better economic sense than do exchange rate converted GDPs for tracking trends in real production or living standards. The following table is based on OECD PPP data. It shows the GDP for Japan as a percentage of that for the USA in 1985, 1990, 1993, 1996, 1999 and 2002.

### JAPAN’S GDP TO USA’S GDP (%)

Converted using:	1985	1990	1993	1996	1999	2002
Exchange rates	33	52	66	60	48	38
PPPs	35	38	39	39	35	34

### AVERAGE ANNUAL GROWTH IN GDP VOLUMES (%)

	1985-2002	1985-1990	1990-1993	1993-1996	1996-1999	1999-2002
Japan	2.2	4.8	1.5	2.2	2.0	0.8
USA	3.0	3.3	1.9	3.4	4.4	2.1

The average annual growth in GDP volumes between 1985 and 2002 was 2.2% in Japan and 3.0% in the USA so, in the absence of significant structural change, the Japanese economy would be expected to have become smaller relative to the USA over the whole period shown above. As can be seen from the above table, this is in fact the case when the comparisons are based on PPPs (a decline in the Japanese economy from 35% of the size of that of the USA to 34% after peaking at 39% around the mid 1990s) but not with the exchange rate based comparison, which shows the Japanese economy increasing its size relative to the USA economy (from 33% to 38%). More importantly, the PPP-converted data show consistently more plausible relationships between the GDP for the two countries for each benchmark year when the

relative rates of GDP volume growth are taken into account. There is a fairly sharp rise between 1985 and 1993 in the size of the Japanese economy relative to the USA's when Japan's growth rates were significantly stronger than the USA's, followed by a large fall from 1996 to 1999 when Japan's growth rate was substantially lower than that of the USA. On the other hand, the exchange rate converted data show changes in the relationship of GDP between the two countries that are economically implausible, with the Japanese economy apparently doubling in size compared with the USA in only 8 years between 1985 and 1993, followed by a sharp reversal between then and 1999 and another large fall between 1999 and 2002.

The table above shows empirically that comparisons between countries over time based on exchange rates can differ significantly from those based on PPPs. This example demonstrates that the exchange rate comparisons produce results which are economically implausible, even when they are between two high-income countries.

In practice, the only certainty with exchange rate based comparisons is that, for any point in time, they will significantly overstate the difference in per capita GDP volumes between high and low-income countries. It is impossible to provide a definitive answer to the question of the extent of the change in this bias over time because it will depend on the countries being compared, the extent of the differences in the structure of their economies at each point in the time series under consideration and other factors which affect exchange rates (e.g. financial flows and interest rates).

## **THE 2005 ICP**

The OECD and Eurostat are responsible for about 45 countries which currently participate in their Purchasing Power Parity Program. Countries in the OECD, Eastern Europe and the Commonwealth of Independent States are included in this regular program which estimates PPP benchmarks, broadly on a 3-yearly cycle. However, the last time a PPP benchmark was established for a large number of the other countries in the world through a global ICP was in 1993. This round was not well run and it excluded a large number of countries, so making sense of the output in a global context was somewhat problematical.

The 2005 International Comparison Program (ICP) will provide the first PPP benchmark since the 1993 round for the majority of countries in the world. A lot of effort has been put into this round of the ICP to improve the quality of the PPPs and the per capita volumes of household final consumption expenditure and GDP derived using the PPPs. The 2005 ICP is more firmly based than earlier ICP rounds. Previous rounds suffered from a lack of dedicated resources, particularly funding and sufficient skilled staff to handle the work involved. The 2005 round is being coordinated by a team set up for the purpose in the World Bank in Washington. Funding has been provided by a number of international organisations and national statistical agencies, supplemented by in-kind assistance provided by these organisations. The project is monitored by an Executive Board which meets approximately 6 monthly. The UNSC strongly supports the ICP.

The ABS is strongly committed to the 2005 ICP. Senior ABS staff have played an active role in planning the 2005 round, and have supported the program by being representatives on key governing bodies and through the provision of technical assistance in the Asia/Pacific region.

## **CONCLUSIONS**

PPPs provide the only valid means of making international comparisons in most situations although exchange rates should be used in certain, limited circumstances, such as in calculating the value of imports able to be purchased from a given level of export receipts or in working out how many \$A are required to purchase a particular sum in a foreign currency.

International comparisons are crucial for shedding light on issues such as identifying the characteristics that distinguish successful economies from those that are less successful, the extent to which income varies around the world, the relative incidence of poverty between countries and whether incomes in different countries are becoming more or less equal over time. In particular, poverty and inequality are areas of interest where the available statistical data are somewhat imprecise, vary in quality from one country to another and also vary over time, and are open to different interpretations depending on the techniques used in their analysis. However, as a result of the review of the data and methods used in the UNDP HDR, the UNSC has reaffirmed the SNA93 recommendation that PPPs should be used for standardising data to a common currency to compare real levels of production and consumption or living standards.

In the past, widespread use of PPP data in such analyses has been held back by the lack of timeliness of the PPP benchmark data being released, misunderstandings on the part of many analysts concerning the ways in which PPP data can be used and misgivings (some real but many imagined) about the accuracy of the data which has often (misguidedly) led to exchange rates being used as a substitute in international comparisons. On the policy side, the outcome has been that much of the effort that should have gone into analysing various data sets has instead gone into debating the usefulness of PPPs versus exchange rates.

## **FURTHER INFORMATION**

Further information on this article may be obtained by contacting Paul McCarthy on (02) 6252 6043 or by email at <paul.mccarthy@abs.gov.au>.

## **Footnotes**

1. Report of the Friends of the Chair of the United Nations Statistical Commission – (Item 6(e) of the provisional agenda of the thirty-second session of the Statistical Commission, 6–9 March 2001) back
2. Page 9 – “International Comparisons of Real Product and Purchasing Power” (Irving B. Kravis; Alan Heston; Robert Summers) – John Hopkins University Press, Baltimore, 1978 back

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